Supplement

SpaceX hereby supplements this application to correct to the radiation hazard analysis provided previously. These corrected calculations, provided below, do not alter the resulting power density figures as previously submitted.

TABLE 1: RADIATION FROM SPACEX PHASED ARRAY TERMINAL (GENERAL POPULATION / UNCONTROLLED)[1]

Input Parameters

Antenna Dimensions, D_1, D_2	0.586, 0.385 m
Frequency, f	14.25 GHz
Max Power into antenna, P_{max}	3.48 W
Max EIRP, $EIRP_{max}$	16218.1 W
Max EIRP, 10 log($EIRP_{max}$)	42.1 dBW
Aperture efficiency, η	73.1%
Maximum Transmit Duty Cycle, DTx[2]	11.8%

Calculated Values

Wavelength, λ $\frac{c}{f}$	0.0211 m
Area of Reflector, $A = D_1 D_2$	0.2256 m^2
Max Antenna Gain, G_{max} $\frac{\eta 4\pi A}{\lambda^2}$	4677.4
Max Antenna Gain, 10 log(G_{max})	36.7 dBi
Length of Near Field, R_{nf} $\frac{D^2}{4\lambda}$	4.08 m
Beginning of Far Field, R_{ff} $0.6\frac{D^2}{\lambda}$	9.79 m

[1] SpaceX will observe lower duty cycle limits, as appropriate, up to a maximum of 11.8% for user terminals with different radiated EIRP or antenna patterns—up to the limits specified in this application—as calculated using the methodology illustrated above. SpaceX notes that this methodology is inappropriately conservative for SpaceX phased-array user terminals but will voluntarily observe the maximum duty cycles described herein to facilitate radiation hazard analysis under the draft OET-69 methodology. SpaceX may provide an alternate analysis in the future to demonstrate compliance with applicable emission limits at increased duty cycles.

[2] As averaged over 30 minutes per FCC OET Bulletin 65 Supplement C.

Maximum Power Density Calculations

Power Density in Far Field, S_{ff} $DTx\frac{EIRP_{max}}{4\pi R_{ff}^2}$	0.16 mW/cm^2
Power Density in Near Field, S_{nf} $DTx\frac{4P_{max}}{\eta A}$	0.99 mW/cm^2
Power Density Off-axis Near Field (20dB below peak), $S_{nf,off\ \ axis}$ $\frac{S_{nf}}{100}$	0.01 mW/cm^2
Power Density at Antenna Surface, S_{ref} $DTx\frac{4P_{max}}{A}$	0.73 mW/cm^2

TABLE 2: RADIATION FROM SPACEX PHASED ARRAY TERMINAL (OCCUPATIONAL / CONTROLLED)[3]

Input Parameters

Antenna Dimensions, D_1, D_2	0.586, 0.385 m
Frequency, f	14.25 GHz
Max Power into antenna, P_{max}	3.48 W
Max EIRP, $EIRP_{max}$	16218.1 W
Max EIRP, 10 log($EIRP_{max}$)	42.1 dBW
Aperture efficiency, η	73.1%
Maximum Transmit Duty Cycle, DTx[4]	59.0%

Calculated Values

Wavelength, λ $\frac{c}{f}$	0.0211 m
Area of Reflector, $A = D_1 D_2$	0.2256 m^2
Max Antenna Gain, G_{max} $\frac{\eta 4\pi A}{\lambda^2}$	4677.4
Max Antenna Gain, 10 log(G_{max})	36.7 dBi
Length of Near Field, R_{nf} $\frac{D^2}{4\lambda}$	4.08 m
Beginning of Far Field, R_{ff} $0.6\frac{D^2}{\lambda}$	9.79 m

[3] SpaceX will observe lower duty cycle limits, as appropriate, up to a maximum of 59% for user terminals with different radiated EIRP or antenna patterns—up to the limits specified in this application—as calculated using the methodology illustrated above.

[4] As averaged over 6 minutes per FCC OET Bulletin 65 Supplement C.

Maximum Power Density Calculations

Power Density in Far Field, S_{ff} $DTx\frac{EIRP_{max}}{4\pi R_{ff}^2}$	0.79 mW/cm^2
Power Density in Near Field, S_{nf} $DTx\frac{4P_{max}}{\eta A}$	4.97 mW/cm^2
Power Density Off-axis Near Field (20dB below peak), $S_{nf,off\ \ axis}$ $\frac{S_{nf}}{100}$	0.05 mW/cm^2
Power Density at Antenna Surface, S_{ref} $DTx\frac{4P_{max}}{A}$	3.64 mW/cm^2